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ELEMENT OF LABOR IN RAILWAY EXPENDITURES.

By ANDREW L. HORST.

For the successful operation of an industrial enterprise provision must be made for depreciation before any earnings can be set aside for the payment of interest or dividends. Any other course consistently followed would soon leave the stock and bond holders only a worthless property. In a factory depreciation is usually provided for by setting aside yearly a certain sum of money from the gross earnings, but the practice of railways differs from this. Roadbed, track and equipment are renewed as fast as they deteriorate, and the cost is charged to operating expenses. In this way the plant is kept up to its standard at the expense of the net earnings, but the effect is the same as if a specific sum had been set aside from the income. This practice of the railways allows them to vary the amount of replacement from year to year according to business conditions. During prosperous years maintenance items may be very heavy, and in times of depression much less of this work may be done because payments to bond and stockholders at such times form a larger proportion of the gross income. The first resort when pressed for money to pay bond interest and to keep up dividends is to cut down operating expenses by stopping repairs and renewals.

The necessity for the reduction of expense is thus brought especially to the attention of railway men in the time of depression. The importance, however, of a systematic reduction in operating expenses, in order to handle traffic economically, is always present. Thus it has been said, "retrenchment is of two kinds, that which is real and that which borrows from the future." [1]

In a time of great necessity much retrenchment is wholly without method, though for a short time great reductions

[1] J. S. Eaton, *Railway Operations*, p. 45.

can be made. Thus it has been pointed out[1] that from maintenance of way and structures 15 or 20 per cent of the entire expenses may be borrowed for six months, from 5 to 8 per cent from maintenance of equipment, and one per cent by a reduction of the labor left in the maintenance departments. During the years immediately following 1893 the saving in cost of operation was largely a borrowing from the capital invested in the property, so that much of the increased expenditures of the last few years has been a repayment at a high rate of discount for these loans.

Real retrenchment, on the other hand, is a systematic reduction and "does not begin at any particular time nor at any particular point, but should be going on all the time and everywhere." This consists of the substitution of new methods and new tools wherever they will produce economy. The complex parts may be so rearranged as to lead to an economy in the operation of the whole system.

The statistics of railway operations in the United States from 1892 to 1900 afford an excellent opportunity to study the results of depression and the consequences of prosperity upon railway operations.[2]

In 1894 the movement of freight traffic was 13,253,007,131 ton-miles, or 14.16 per cent less than during 1893. From 1890 to 1893 the traffic density showed an average annual increase of 25,791 tons carried one mile per mile of line, but in 1894 the decrease was 93,980. Freight train mileage decreased by 61,912,283, while the average annual increase from 1890 to 1893 had been 31,379,733. It followed then that for 1894 every income item showed a decrease. Gross earnings were $147,390,077, or 12 per cent less in 1894 than

[1] J. S. Eaton, *Railway Operations*, p. 47.

[2] This paper is based upon information found in the Annual Reports on the Statistics of Railways in the United States, prepared by the Statistician to the Interstate Commerce Commission, Washington, D. C., 1889–1901.

A suggestive article by H. T. Newcomb, "Some of the Consequences of Railway Prosperity," appeared in *Gunton's Magazine*, December, 1900, in which the effects of prosperity on railway expenditure were shown by comparing the years 1895 and 1899. This paper consequently approaches in some parts the plan there followed.

in 1893, and net earnings $50,883,100 less. The year closed with a deficit of $45,851,294, though operating expenses were decreased $96,506,977, or 11.66 per cent.

To meet this deficit and to make payment of the usual dividends it was necessary to reduce the corporate investment in stock and bonds by $7,094,413, to reduce the cash and current assets by $44,402,673, and to draw upon the fund of materials and supplies to such an extent that the stock on hand was worth $13,988,383 less at the close than at the beginning of the year.

The chief resource in meeting the decline in revenue was to reduce the cost of operation, since fixed charges must be paid and dividends yield only slowly to a decline in income. This reduction in operating expenses amounted to $96,506,977, or 11.66 per cent for 1894. Of this amount $25,588,990, or 26.5 per cent, was taken from the maintenance of way, reduced 15.12 per cent; $23,981,383, or 24.85 per cent from maintenance of equipment, reduced 17.52 per cent; $40,952,540, or 42.43 per cent from conducting transportation, reduced 9.40 per cent; and $5,777,340, or 6 per cent, from general expenses, reduced 6.76 per cent. Or combining maintenance of way and structures and maintenance of equipment, $49,570,373, or 51.36 per cent of the retrenchment was accomplished by reducing expenditures in these departments 16.19 per cent.

Geographically there was a wide variation in the extent of these reductions. Thus the largest total of 17.4 per cent was in the Northwestern States (Group VII), and 13.9 per cent in the Central West (VIII). In contrast to this were Texas and the South Atlantic States (IX and IV). This reduction was accomplished in different items in the several territorial groups. In New England (I) equipment furnished the principal reduction, maintenance of way and of equipment in the Middle States (II), while in the Middle West (III) maintenance of way was most largely reduced. The chief resort in the South Atlantic States (IV), in the Central Northwest (VI), in the Central West (VIII) and

in the Pacific States (X) was the item of equipment. Maintenance of way, on the other hand, supplied the reduction in the Southern Mississippi States (V), the Northwestern (VII) and contributed largely in the Pacific States (X). In contrast to this, general expenses increased in Texas (IX) and the South Atlantic States (IV).

DECREASE OF OPERATING EXPENSES, PER CENT DECREASE 1894 UNDER 1893, AND PROPORTION OF OPERATING EXPENSES 1893, 1894.

Source of Expenditure.	Decrease.		Proportion of Decrease.	Proportion of Total Operating Expenses.	
	Amount.	Per cent.		1893.	1894.
Maintenance of way, etc. .	$25,588,990	15.12	26.51	20.45	19.64
Maintenance of equipment	23,981,383	17.52	24.85	16.53	15.43
Conducting transportation	40,952,540	9.40	42.43	52.60	53.94
General expenses	5,777,340	6.76	6.00	10.33	10.91
Unclassified	206,724	26.76	.21	.09	.08
Total	$96,506,977	11.66	100.00	100.00	100.00
Maintenance : way, structures, and equipment . .	49,570,373	16.19	51.36	36.98	35.07

DECREASE IN OPERATING EXPENSES 1894 UNDER 1893, BY GROUPS AND SOURCES OF EXPENDITURE.

Group.	Total Amount.	Total Per cent.	Maintenance of		Conducting Transportation. Per cent.	General Expenses. Per cent.
			Way. Per cent.	Equipment. Per cent.		
I	$6,538,595	10.75	13.68	26.30	5.04	14.66
II	25,028,656	12.14	17.53	17.79	9.19	8.33
III . . .	16,212,619	12.04	21.95	11.23	10.69	.41
IV . . .	1,390,067	4.56	3.19	15.56	2.37	2.59[1]
V . . .	6,430,385	11.02	15.21	11.87	10.82	3.56
VI . . .	21,408,222	13.45	14.80	22.15	11.47	8.11
VII . . .	5,321,847	17.38	17.15	18.44	16.49	20.22
VIII . .	10,238,600	13.95	11.36	24.09	12.18	12.63
IX . . .	32,434	.10	5.21	2.92	1.85[1]	5.38[1]
X	3,905,552	9.14	10.83	14.12	7.22	5.45
Total . .	$96,506,977	11.66	15.12	17.52	9.40	6.76

[1] Increase.

A comparison of the railways in the Mississippi Valley can be made with those in the Atlantic and Pacific States, and in Texas, from which it is seen that operating expenses in the Mississippi Valley were reduced more than in the rest of the country.

DECREASE IN OPERATING EXPENSES, 1894 UNDER 1893.

Mississippi Valley.			Atlantic, Pacific States and Texas.		
Groups.	Decrease.	Per cent.	Groups.	Decrease.	Per cent.
III . . .	$16,212,619	12.04	I	$ 6,538,595	10.75
V	6,430,385	11.02	II . . .	25,028,656	12.14
VI . . .	21,408,222	13.45	IV . . .	1,390,067	4.56
VII . . .	5,321,847	17.38	IX . . .	32,434	.10
VIII . . .	10,238,600	13.95	X . . .	3,905,552	9.14
Total . . .	$59,611,673	13.08	Total . .	$36,895,304	9.92

A large part of this reduction in expenditure was secured by reducing the number of employees 93,994 or 10.76 per cent. Though this reduction affected all classes, it was greatest among those engaged in maintaining the character of roadway, structures, and equipment. Thus in maintenance of way, where 27 to 29 per cent of the employees are found, the number was reduced about 16 per cent, making up 44 per cent of the total decrease; 25 per cent of the reduction was made by cutting down maintenance of equipment 13 per cent; and 34 per cent by reducing conducting transportation only 8 per cent. If the decrease in the number of employees per 100 miles of line is taken the reduction in the maintenance departments is further shown.

DECREASE IN NUMBER OF EMPLOYEES PER 100 MILES.

Class of Work.	1893.	1894.	Per cent Decrease.
Maintenance of way	151	123	18.54
Maintenance of equipment	103	86	16.50
Conducting transportation	234	208	11.11
General expenses	21	18	14.29
Unclassified	5	8	60.00 [1]
Total	515	444	13.78

[1] Increase.

Interest attaches to the geographical distribution of this reduction. Thus in the whole country the only increase in the number of employees took place in the Pacific States (X), and the greatest decrease in the Middle West (III) and in the Central Northwest. But in these instances exceptional conditions contributed to the result. In the first case 300 miles, not included in the report of 1893, of the Great Northern Railway were put into operation, and the traffic of the latter groups had been especially stimulated by the Columbian Exposition. The largest curtailment of expenditure had been in the Northwest (VII), and here, also, the largest reduction in maintenance and in movement seems to have taken place.

An analysis, according to the classes of employees, shows that the principal reduction was made among trackmen, reduced 16 per cent or 31 per cent of the total, and among laborers. In conducting transportation other trainmen and firemen were the classes to be cut down; and in maintenance of equipment, carpenters and other shopmen. It may then be said that, as between the skilled and the unskilled classes, the chief reduction was made in the classes of comparatively unskilled labor.

DECREASE IN NUMBER OF EMPLOYEES, 1894 UNDER 1893.

Class of Work.	Decrease.		Proportion of Decrease.	Proportion of Total Number.	
	Number.	Per cent.		1893.	1894.
Maintenance of way, etc. .	40,841	15.95	43.45	29.33	27.63
Maintenance of equipment	23,490	13.39	24.99	20.08	19.49
Conducting transportation	32,023	8.05	34.06	45.55	46.94
General administration .	3,635	10.27	3.86	4.05	4.07
Unclassified	5,995[1]	69.54[1]	6.36[1]	.99	1.87
Total	93,994	10.76	100.00	100.00	100.00
Maintenance : way, structures, and equipment . .	64,331	14.90	68.44	49.41	47.12

[1] Increase.

DECREASE IN NUMBER OF EMPLOYEES BY GROUPS AND BY CLASS OF WORK, 1894 UNDER 1893.

Group.	Total Number.	Total Per cent.	Maintenance of		Conducting Transportation. Per cent.	General Administration. Per cent.
			Way. Per cent.	Equipment. Per cent.		
I . . .	7,249	11.06	18.98	7.79	7.99	11.91
II . . .	15,450	6.89	8.69	6.37	6.56	1.29
III . . .	20,680	14.99	27.30	15.72	8.97	10.18
IV . . .	3,698	8.64	17.13	1.46[1]	5.05	1.25[1]
V . . .	8,237	12.40	14.40	18.91	7.25	4.60
VI . . .	26,168	15.36	18.00	12.61	9.68	12.86
VII . .	2,689	10.12	29.34	60.49	38.34	52.91
VIII . .	7,762	10.89	13.84	23.02	9.93	16.37
IX . . .	4,469	12.51	23.47	16.02	8.17	6.29[1]
X . . .	2,408[1]	7.37	14.38	5.42	13.37[1]	25.95
Total . .	93,994	10.76	15.95	13.39	8.05	10.27

[1] Increase.

CLASSIFICATION OF EMPLOYEES, DECREASE AND PROPORTIONATE DECREASE 1894 UNDER 1893.

Class.	Decrease.		Per cent of Total Decrease.
	Number.	Per cent.	
General officers . . . } Other officers . . . . }	425[1]	6.43[1]	.45[1]
General office clerks . .	2,805	10.20	2.98
Station agents	180[1]	.64[1]	.19[1]
Other station men . . .	4,031	5.36	4.29
Enginemen	3,315	8.55	3.53
Firemen	4,032	9.99	4.29
Conductors	2,714	9.86	2.89
Other trainmen	9,542	13.08	10.15
Machinists	1,624	5.26	1.73
Carpenters	5,550	13.25	5.90
Other shopmen	9,350	9.98	9.95
Section foremen	39	.13	.04
Other trackmen	29,443	16.34	31.32
Switchmen, flagmen . .	2,829	6.15	3.01
Telegraph operators . .	474	2.09	.51
All other employees . . .	18,851	16.89	20.05
Total.	93,994	10.76	100.00

[1] Increase.

In contrast to this depression and heroic retrenchment, interest attaches to the revival of industry and the character of the expenditure consequent to this increased commercial activity. For the three years, 1894, 1895, and 1897 the railways of the United States showed deficits; for the year 1893 the surplus was $8,116,745; and for 1896, only $1,534,169. The renewed prosperity of the last few years is shown by comparing the gross earnings per mile of line operated, from which it is seen that gross earnings reached those of 1893 only in 1900; and compared with 1894 showed an increase of 26 per cent.

GROSS EARNINGS FROM OPERATION, YEARS ENDING JUNE 30.

Year.	Per Mile of Line.	Year.	Per Mile of Line.
1890	$6,725	1896	$6,320
1891	6,800	1897	6,122
1892	7,213	1898	6,755
1893	7,190	1899	7,005
1894	6,109	1900	7,722
1895	6,050		

This improvement in revenue represented an absolute improvement, and did not mean, as in the case of an industrial enterprise, exceptional profits made by reason of a rise in the market value of the product, since the revenue per ton-mile increased over 1899 only seven-tenths of one per cent and decreased, under 1893, 17 per cent.[1] There was also no stock of goods on hand, the book value of which could be marked up. The increased revenue was due thus almost solely to an enlargement of the volume of traffic.

This increase in the volume of business involved an addition to the expenses; the number of men was increased, and the outlays for material and supplies were also enlarged. In this way the bulk of the earnings was used up, so that a comparatively small part went to bond and stockholders. Thus, in 1894, though there was a deficit of $45,851,294

[1] The average revenue per ton of freight per mile in 1893 was .878 cents; in 1899 it was .724 cents; and in 1900, .729 cents.

from operation, $95,515,226 was paid in dividends; in 1895, $85,287,543 was paid as dividends, though the deficit from operation was $29,845,241. But, in 1900, $139,597,972 went as dividends, and of this amount $118,624,409 was paid to individuals and corporations other than railways. There remained "available for adjustments and improvements"

INCREASE OF OPERATING EXPENSES, PER CENT INCREASE 1900 OVER 1895, AND PROPORTION OF OPERATING EXPENSES 1895, 1900.

Source of Expenditure.	Increase.		Proportion of Increase.	Proportion of Total Operating Expenses.	
	Amount.	Per cent.		1895.	1900.
Maintenance of way, etc. .	$67,244,177	46.70	28.53	19.84	21.97
Maintenance of equipment	67,385,171	59.22	28.59	15.68	18.84
Conducting transportation	97,967,363	22.72	41.56	59.41	55.04
General expenses	3,421,748	9.53	1.45	4.95	4.09
Unclassified	310,363 [1]	34.48 [1]	.13 [1]	.12	.06
Total.	$235,708,096	32.48	100.00	100.00	100.00
Maintenance : way, structures and equipment . .	134,629,348	52.23	57.12	35.52	40.81

[1] Decrease.

$142,754,358 in 1900, and of this $25,500,035 went into permanent improvements, besides the amounts on account of operation expenses, and $87,657,933 remained as a surplus.

The movement of railway expenditures as a result of these prosperous conditions can be shown by a comparison of the operating expenses for the years 1900 and 1895.[1] Thus the increase of 1900 over 1895 was 32.48 per cent, of which 28.5 per cent came from increasing maintenance of way 46.7 per cent; 28.6 per cent from maintenance of equipment increased 59 per cent. Or, taking these two items together, 57 per cent of the increase was caused by increasing these maintenance items 52 per cent. The effect of this is shown by the proportion of these items in the total operating expenses between the two years.

[1] In 1895 the "Revised Classification of Operating Expenses" was first used, so that the classification used in 1895 and since then differs somewhat from that used in 1894. To make a comparison with 1900 the year 1895 should be used.

This increase in operating expenses should be compared with the reduction made in 1894. Thus maintenance of the property in 1894 was reduced $49,570,373, or 16 per cent, while the total decrease was 11.6 per cent. In 1900 the expenditures for maintenance of the property exceeded those of 1895 by 52 per cent, while the total increase was 32.5 per cent. Thus the increase in 1900 over 1895 of the expenditures for these maintenance items was equal to a return of more than two and one-half times the decrease in 1894. If the comparison is made with 1893, it is found that for maintenance alone $86,260,116 or 28 per cent more was expended in 1900 than in 1893. This was equivalent to the return of the principal borrowed from the property in 1894 and 74 per cent interest.

The effect of this increased expenditure upon business must have been very important. The demands of the railways are diversified and affect many industries. The modification of these demands, due to periods of depression and prosperity, are an important determinant of the activity or stagnation of these important industries. The table on page 69 presents an analysis of the increase in certain classes of operating expenses for the years 1895 and 1900.

These classified expenditures included both direct payments to employees in making the different kinds of repairs and renewals as well as payments to outside firms and individuals for materials that were used in repairs and renewals. The comparison should be made between the increase in items of renewals and repairs and the items of conducting transportation, from which it is found that the increase for engine and roundhouse men was 30 per cent, switchmen 29 per cent, and superintendence 45 per cent. On the other hand, expenditures for buildings and fixtures increased 104 per cent, docks and wharves 79 per cent, freight cars 75 per cent, and locomotives 62 per cent.

INCREASE OF CLASSIFIED OPERATING EXPENSES 1900 OVER 1895.

	Increase.	
	Amount.	Per cent.
Repairs and renewals: —		
Roadway	$32,434,118	46.94
Rails	392,677	3.87
Ties	8,085,028	40.63
Bridges and culverts	9,650,787	63.02
Fences, etc.	2,188,605	62.38
Buildings and fixtures	11,643,452	104.63
Docks and wharves	1,255,226	78.93
Telegraph	509,048	56.18
Locomotives	23,938,112	62.62
Passenger cars	5,944,799	39.82
Freight cars	30,427,653	74.99
Work cars	1,506,762	184.11
Marine equipment	1,185,746	104.77
Shop machinery and tools	2,505,289	81.60
Conducting transportation: —		
Engine and roundhouse men	20,547,031	30.68
Fuel for locomotives	20,322,220	28.91
Train service	12,929,541	23.95
Station service	10,816,794	19.75
Switchmen, flagmen and watchmen	8,333,747	29.67
Superintendence	5,304,568	45.72
Salaries of general officers	615,013	6.84
Salaries of clerks and attendants	2,372,188	25.37
Total	$224,804,614	42.13
Total operating expenses	$248,203,915	36.77

These figures show the great increase in expenditures for equipment and structures. But it can hardly be concluded therefrom that there was a greater renewal of equipment than repairs on roadway. The items in maintenance of way are made up very largely of compensation paid to labor, while expenditures for renewal of equipment involve large payments for material and finished products. The higher prices,[1] then, for iron and steel, metals and lumber, made it

[1] In the fiscal year 1894–95 the index number of iron manufactures was 52; in 1899–1900 for the same group it was 89. For the group of minerals, metals and lumber in 1894–95 the index number was 92; in 1895–96 it was 89; in 1899–1900, 110 and even 115 in November and December, 1899.—(*Quarterly Bulletin, Bureau of Economic Research*, July and October, 1900.)

In the *Final Report of the Industrial Commission* (vol. xix), p.289, the great increase in the cost of material and supplies of 1900, as compared with 1897, is shown for 62 articles. The percentage increase in the price of some of the most important articles was as follows: Lubricating oil, 120; machine bolts, 150; steel axles, 131; track spikes, 135; nails, 109; coal, 44; sheet iron and steel, 48.

necessary to expend more in 1900 than in 1895 to renew or replace the same amount of equipment. It may be concluded that the volume of labor employed directly increased relatively more during this time than the volume or units of equipment maintained, though the amount expended for maintenance of equipment showed a greater increase than that for maintenance of way.

The full effect, however, of high prices in 1899 and 1900 should not be looked for in the expenditures of 1900. Much of the material used in 1900 was purchased a year or more earlier, and so at lower prices. Moreover, the large increase in the volume of new equipment during the years 1898-1900, much of which was not replacement, but an addition to the earning power of the property and consequently charged to capital account, did not require repairs during the first few years. The burden of repairing the equipment may be fully felt only within the next few years, so that in connection with high prices expenditures for maintenance of equipment may be expected to show a steady increase. Thus the expenditures for material and supplies may become increasingly more important than the increase in the direct employment of labor.

This tendency can perhaps be seen already by comparing the increase in the expenditures for maintenence of way and of equipment for several years. Thus, in 1895, 19.824 per cent of total classified operating expenses went to maintenance of way, and 21.797 per cent in 1900 went to the same source; and for the same years 15.761 per cent and 18.929 per cent, respectively, went to maintenance of equipment. This was an increase of 1.973 for maintenance of way and of 3.168 for equipment, or an increase almost two-thirds greater for equipment than for maintenance of way. The difference in the relative increase is more striking by taking 1898 for comparison. In this year maintenance of way was 21.028 per cent of total classified expenses, showing an increase for 1900 of .769; and maintenance of equip-

ment 17.359 per cent, an increase of 1.570. For these two years, then, the increase per cent of expenditures for equipment was twice that for maintenance of way. Conducting transportation consequently declined from 59.46 per cent of classified expenses in 1895 to 55.179 per cent in 1900.

Attention is usually called to the dependence of railways for their prosperity upon the general business conditions and the activity of other industries. But the importance of railway expenditures in sustaining or inducing business activity is too often overlooked. These expenditures are essentially cumulative and progressive in their influence, not only upon those industries producing railway supplies, but upon the railways themselves. The expenditure of one year contributes to an increase in the gross income of the next year, and makes possible a greater surplus to be expended a year later, so that each increase of the railway for material and supplies contributes, by the expansion in trade which it creates, to bring a greater increase for the next year. Since the amount runs into the hundred millions, the influence of railway consumption is a powerful stimulus to business prosperity.

The geographical distribution of this increase brings out the prominence of the Southern Mississippi and the Northwestern States (V, VI, VII), both in the total and in the several different sources of expenditure. In the retrenchment of 1894 the Northwestern States (VII) were first in magnitude, but in the increase they were exceeded by several other groups. The South Atlantic States (IV) and Texas (IX), where the smallest decrease had taken place, seem not to have been affected by this fact so far as an increase in expenditure upon the return of prosperity was concerned. Thus, in general, railways in the Mississippi Valley, which had suffered most during the depression, as shown by the retrenchments, made the greatest increase in operating expenses in time of prosperity. It

is safe to say that in this part of the country the most pronounced development of railways has taken place within recent years. This result can be traced to the activity of certain large railways operating in this part of the country.

PER CENT OF INCREASE IN OPERATING EXPENSES, 1900 OVER 1895 FOR SELECTED ROADS.

Groups.	Railway.	Total.	Maintenance of		Conducting Transportation.
			Way.	Equipment.	
IV, V . .	Southern	83.72	56.50	158.08	76.56
V, VI . .	Illinois Central	75.18	116.57	69.12	63.24
V, VI . .	Louisville & Nashville	52.01	59.26	63.17	42.83
V, VI . .	Mobile & Ohio	103.94	84.28	70.41	138.27
VI, VII, .	C. B. & Q.	60.45	106.16	134.20	38.93
VI, VII, X	Great Northern	62.91	87.82	71.50	51.94

INCREASE IN OPERATING EXPENSES, 1900 OVER 1895, BY GROUPS AND SOURCES OF EXPENDITURES.

Group.	Total Amount.	Total Per cent.	Maintenance of		Conducting Transportation. Per cent.	General Expenses. Per cent.
			Way. Per cent.	Equipment. Per cent.		
I	$10,547,762	18.59	23.29	32.54	14.76	1.81
II . . .	45,462,578	24.50	38.72	49.89	13.93	23.48
III . . .	37,727,934	32.46	57.60	68.66	18.02	2.71
IV . . .	8,872,768	31.06	40.68	61.99	21.16	1.22 [1]
V	24,612,173	46.27	47.70	71.49	41.28	25.78
VI . . .	58,306,080	45.93	82.89	80.79	30.54	4.41 [1]
VII . . .	9,893,023	41.69	68.93	71.99	28.00	12.58 [1]
VIII . .	20,361,815	33.39	29.09	58.10	30.36	17.86
IX . . .	7,279,823	21.66	16.78	29.89	22.82	10.02
X	12,644,140	31.41	21.52	53.60	31.61	20.95
Total . .	$235,708,096	32.48	46.70	59.22	22.72	9.53

[1] Decrease.

This increase in operating expenses cannot be explained by an increase in mileage, because the past decade was not prominent for railway construction. Increased traffic also is not sufficient explanation, though it may have made an addition to the expense necessary. The cost of operating a

railway does not increase in direct proportion to additional traffic handled. Thus the largest increase in traffic density was in Groups X and III (the Pacific States and Middle West), but other groups largely surpassed these in increased expenditures for operation. The capitalization per mile of line in these groups (X and III) was very high in 1900, so that a good physical condition of the roadway and of equipment had undoubtedly resulted from large capital expenditures. Because of this favorable condition of the property, doubtless less expenditure for maintenance was necessary. In the Southern Mississippi and Central Northwestern States (V and VI) the increase in operating expenses was very great, though the increase in mileage and in traffic density was only about the average. But here capitalization per mile of line in 1900 was very much below the average for the whole country. It is safe to say that the increase in

INCREASE PER CENT, 1900 OVER 1894, IN MILEAGE AND TRAFFIC DENSITY, AND RAILWAY CAPITAL PER MILE OF LINE, 1900.

Group.	Mileage.	Ton-Miles per Mile of Line.	Capital per Mile of Line.
I	6.3	39.7	$ 61,246
II	5.5	55.1	112,255
III	4.2	88.7	64,729
IV	10.8	79.5	57,684
V	8.9	55.1	42,707
VI	8.2	60.8	47,087
VII	7.5	65.4	51,952
VIII	9.0	50.1	60,324
IX	13.5	55.7	44,378
X	11.3	90.1	78,806
Total	8.2	60.8	$61,490

operating expenses of 1900 over 1895 was not the result of increased traffic handled, nor of new mileage put into operation, but depended more upon the physical condition of the property. This, at least, must be the explanation for Group V, where the railways have had poor road-bed and inefficient equipment. The replacement and renewal of this equipment

by heavier and more efficient rolling stock, made necessary large expenditures for maintenance of way. To bring the railways operating between the Ohio River and the Gulf up to the standard in efficiency is especially imperative, because of the competition that these roads are undertaking with the large trunk lines for much of the western produce, which they are seeking to carry to the Gulf ports for export, instead of permitting it all to go to Atlantic ports.

During this time the total amount of compensation paid to railway employees increased from $445,508,261 in 1895 to $577,264,841 in 1900, or 29.6 per cent. As between the different classes of employees the smallest increase went to general officers and the largest increase to other officers, though the increase of this latter class was only 2.5 per cent of the total increase. The other classes to receive greatly increased compensation were trackmen, other employees, carpenters and shopmen.

This increased compensation going to general classes of employees was not due to greatly increased wages. The rate of daily wages during the period of depression showed no marked decrease. The investigations of the Department of Labor[1] showed that for 25 occupations, taking the wages for 1891 as 100, the decline was only 1.9 per cent from 1893 to 1894, and for 192 occupations only 1.26 per cent. The index number of wages for conductors decreased 4.8 per cent; locomotive engineers, 5.3 per cent; and laborers, 3 per cent. The per cent increase, 1900 over 1895, of the index number for 192 occupations was 5.5 per cent. But rates of daily wages are inadequate by themselves to show the effect of depression or prosperity upon labor, because they neglect the quantity of employment. The rate of daily wages should be qualified by a coefficient of the amount of employment. But the railways, perhaps more than any other industry, furnish steady employment

[1] *Bulletin of the Department of Labor*, September, 1898, p. 668, and September, 1900, p. 914.

throughout the year to the men employed, so that the greater part of the saving in the pay-roll was accomplished by a reduction in the number of employees, and the increase in compensation was due not nearly so much to increased average wages as to a large increase in the number of men employed. The fact that average yearly compensation for all employees was exactly the same in 1900 as in 1895 seems to lead to the same conclusion.

This increase in the number of employees can be shown best by comparing the years 1900 and 1894. The total increase was 238,045, or 30.5 per cent. The employees in maintenance of way increased 50.8 per cent; 65 per cent of the total increase was due to the increase in maintenance of way and of equipment of 42 per cent.

INCREASE AND AVERAGE YEARLY COMPENSATION PAID RAILWAY EMPLOYEES, 1900 OVER 1895.

Classes.	Total Increase.		Average Yearly Compensation.	
	Amount.	Per cent.	1895.	1900.
General officers	$922,734	7.6	$2,262	$2,676
Other officers	3,286,676	67.7	1,915	1,744
General office clerks	4,306,269	22.9	708	717
Station agents	1,871,872	11.2	575	587
Other station agents	7,166,300	18.6	522	508
Enginemen	11,222,500	28.4	1,138	1,183
Firemen	6,632,466	29.4	635	661
Conductors	6,380,842	26.8	957	1,004
Other trainmen	8,340,340	22.9	582	604
Machinists	5,200,531	29.4	639	698
Carpenters	7,182,472	34.3	589	603
Other shopmen	14,732,264	32.9	504	519
Section foremen	1,745,891	10.5	561	558
Other trackmen	21,150,401	41.9	325	316
Switchmen, flagmen	5,344,989	22.0	562	582
Telegraph operators	2,561,090	18.8	648	641
All other employees	23,708,943	54.4	489	506
Total	$131,756,580	29.6	$567	$567

The contrast of the increase in the number of men engaged in maintenance and of those engaged in movement is shown

by the relative number in each class per 1000 employees. Thus the rate for transportation decreased 27 and for general administration 5, while for maintenance of equipment the number was the same for both years; and for maintenance of way the increase was 43. Maintenance of property in 1900 had thus assumed, judging from the distribution of employees per 1000, relatively greater importance than the mere movement of traffic. The reason for this is found in the increased efficiency of the men engaged in conducting transportation as a result of improved roadway and better equipment which made heavier trains possible.

Geographically the largest increase took place in the Pacific and the Southern Mississippi States (X, V). The largest reduction in 1894 had been in the Middle West and in the Central Northwest (III, VI), but, in view of the special conditions found in these groups, it is safe to say that the permanent force was reduced most largely in Texas and in the Southern Mississippi States (IX, V). In these groups the largest increase also took place, except in the Pacific States (X), so that the railways in these geographical divisions had increased in 1900 over 1894 the number of employees from three and one-half to four times the reduction that had been made in 1894. The Northwestern States (VII) also showed an increase that was four-fold the decrease. New England (I), in contrast to the rest of the country, had a rate of increase smaller than the reduction that had been effected in 1894.

A more detailed analysis shows that the principal increase had taken place in certain definite classes. Thus trackmen increased 50 per cent, which was 32 per cent of the total increase. Other employees increased 43 per cent, or 16.9 per cent of the total; and shopmen 36 per cent, or 12 per cent of the total. The class of other officers increased 162 per cent, but this made up only 1.2 per cent of the total. In contrast to this was the decrease in general officers, and the small rate for section foremen, station agents, machinists

and telegraph operators. Though the per cent increase in compensation was 29.6 per cent, and in the number of employees 30.5 per cent, it is important to note that the increase in the number of employees per 100 miles was only 19 per cent. This was an increase of less than 3 per cent over 1893 per 100 miles, while the absolute increase was

INCREASE IN NUMBER OF EMPLOYEES, 1900 OVER 1894.

Class of Work.	Increase.		Per cent of Total Increase.	Number per 1,000.		Increase.
	Number.	Per cent.		1894.	1900.	
Maintenance of way, etc. .	109,575	50.87	46.04	276	319	43
Maintenance of equipment	45,825	30.15	19.25	195	195	—
Conducting transportation	84,171	23.00	35.36	469	442	27 [1]
General administration .	4,702	14.81	1.97	41	36	5 [1]
Unclassified	6,228 [1]	42.59	2.62 [1]	19	8	11 [1]
Total	238,045	30.53	100.00	1,000	1,000	—
Maintenance: way, structures, and equipment . .	155,400	42.30	65.29	471	514	43

[1] Decrease.

INCREASE IN NUMBER OF EMPLOYEES BY GROUPS AND BY CLASS OF WORK, 1900 OVER 1894.

Group.	Total Number.	Total Per cent.	Maintenance of		Conducting Transportation. Per cent.	General Administration. Per cent.
			Way. Per cent.	Equipment. Per cent.		
I	6,366	10.93	16.23	2.01 [1]	12.46	10.15
II	38,690	18.52	29.24	22.56	13.83	.32
III . . .	39,111	33.36	78.14	33.55	18.88	8.44 [1]
IV . . .	6,965	17.81	1.50	66.51	6.49	62.69
V	29,747	51.13	48.83	52.97	54.76	37.11
VI . . .	58,692	40.76	75.41	17.08	25.09	1.19
VII . . .	9,657	40.44	123.74	133.76	98.17	116.12
VIII . . .	16,724	26.33	34.42	24.17	32.44	21.25
IX . . .	13,357	42.73	67.65	45.19	31.91	52.81
X	18,736	53.42	62.13	57.69	40.02	63.63
Total . . .	238,045	30.53	50.87	30.15	23.00	14.81

[1] Decrease.

PROPORTIONATE INCREASE OF EMPLOYEES BY CLASSES, 1900 OVER 1894.

Classes.	Increase.		Per cent of Total Increase.
	Number.	Per cent.	
General officers	341 [1]	6.49 [1]	.14 [1]
Other officers	2,891	162.59	1.22
General office clerks	7,486	30.21	3.15
Station agents	3,411	12.10	1.43
Other station men	18,701	26.28	7.86
Enginemen	7,371	20.78	3.10
Firemen	7,803	21.50	3.28
Conductors	5,134	20.70	2.16
Other trainmen	10,857	17.12	4.56
Machinists	3,586	12.26	1.50
Carpenters	10,338	28.46	4.34
Other shopmen	30,414	36.06	12.78
Section foremen	3,425	11.55	1.44
Other trackmen	76,088	50.49	31.96
Switchmen, flagmen	7,570	17.52	3.17
Telegraph operators	3,073	13.90	1.29
All other employees	40,238	43.40	16.90
Total	238,045	30.53	100.00

[1] Decrease.

16.4 per cent. This indicates that the number of employees in proportion to the miles of railway increased less than one-fifth as much as the per cent of absolute increase. This taken in connection with the increase in traffic shows that the rate of increase in employment has really been very small, and that this itself may be due to the very large increase in several classes, notably among trackmen.[1]

Among the classes of the more skilled the number of men per 100 miles in 1900 had not reached the number of 1893. Thus in conducting transportation the number of men per 100 miles of line had actually decreased or remained at the same level. The only class to show any increase was the

[1] In 1893 the number of employees per 100 miles of line was 515; in 1894, 444; and in 1900, 529. There was thus an increase of 14 in 1900 over 1893. As between the several classes of employees, trackmen increased 12, other shopmen 5, while enginemen and firemen decreased 1 each, other trainmen 4, and machinists and carpenters each 1 in 1900 over 1893. With this large proportionate increase in trackmen and other shopmen the employees per 100 miles would have been less in 1900 than in 1893.

unskilled and a slight increase in general administration. Where improvements in machinery entered only slightly the relative amount of employment increased greatly over even the active year 1893, but so far as mere movement and work in the shops were concerned a smaller proportionate number of men were employed.

The special line of work in which the railways of different parts of the country have made most pronounced improvements is apparent from an examination by geographical

INCREASE PER CENT IN THE NUMBER OF EMPLOYEES BY GROUPS AND BY CLASSES, 1900 OVER 1894.

Class.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
General officers . .	28.8[1]	23.4[1]	19.2[1]	13.0	6.9	2.1	6.7[1]	13.8	13.7	29.0
Other officers . . .	93.5	37.1	177.9	1,106.8	335.2	109.6	158.3	180.0	121.5	195.0
General office clerks	31.3	23.4	18.1	51.1	39.0	20.5	68.1	28.5	63.5	75.9
Station agents . . .	5.2	18.4	4.2	8.3	25.5	8.0	6.7	14.5	18.7	14.0
Other station men .	30.9	12.2	23.8	25.4	55.9	31.7	38.7	33.6	27.3	38.3
Enginemen	6.8	12.2	23.2	14.0	38.3	22.9	24.5	25.3	34.7	37.3
Firemen	4.1	15.4	24.4	11.8	34.0	22.0	30.6	28.8	40.1	32.3
Conductors	4.2	15.4	18.0	7.7	42.0	21.9	39.1	26.4	33.6	50.8
Other trainmen . .	3.6	8.1	22.4	3.4[1]	34.1	23.4	45.8	32.0	32.0	41.4
Machinists	8.3[1]	11.0	20.5	20.4	22.6	1.1	19.6[1]	28.3	32.1	49.4
Carpenters	8.6[1]	18.4	25.2	54.9	67.5	39.5	6.0	18.1	58.0	26.1
Other shopmen . .	14.3	30.8	46.3	90.7	52.5	24.8	13.1	26.3	19.7	80.3
Section foremen . .	12.7	12.3	10.5	1.9	25.3	2.7	10.7	13.8	19.1	28.3
Other trackmen . .	17.7	33.1	58.0	8.3	52.2	94.9	85.3	31.0	61.8	47.8
Switchmen, flagmen .	1.3	12.5	14.0	10.6	48.1	22.8	25.0	19.1	23.7	47.3
Telegraph operators .	22.4	3.7[1]	12.0	17.4	42.3	23.3	39.7	18.3	12.2	42.5
All other employees .	.5	21.6	64.3	15.7[1]	103.6	77.5	47.9	21.7	59.5	86.9
Total	10.9	18.5	33.4	17.8	51.1	40.7	40.4	26.3	42.7	53.4

[1] Decrease.

divisions of the increase in the number of employees in different classes of labor. Thus in New England (I) the development took place in general administration and in maintenance of way, together with greater attention paid to station service. In the Middle States (II) the development has been among shopmen and trackmen, showing the policy of equipment and roadway improvement, and the growth of transportation service shown by the increase in enginemen

and conductors. This improvement of the roadway and equipment is also shown in the Middle West (III), and with it the increased service in movement made necessary by the great volume of traffic. Equipment, to the exclusion of nearly everything else, received the greatest attention in the South Atlantic States (IV), while in the Southern Mississippi States (V) attention was paid to roadway as well as to equipment. In the Northwest (VI, VII) the chief development was shown in roadway and in movement, and a smaller increase in betterment of equipment. In what may be called the Central West (VIII) is shown to have attended most to movement and roadway, administration and station service. Movement and roadway were the chief items in Texas (IX), and in the Pacific States (X) the largest increase was in men employed in the shops and in moving traffic. The department of general administration shows remarkable variations. The class of general officers increased only slightly in some of the groups, while in others there was a decrease. On the other hand, the class of other officers, though small in absolute numbers, increased out of all proportion to the other classes. This was due to the small number, so that a slight change was represented by a large percentage. The effect of consolidations also decreased the number of general officers and filled their places with other officers, or retained the same men who were then no longer classed as general officers.

This gives an idea of the particular departments of the transportation service which the railways of the different sections felt it important to improve, in order to increase the earning power of the property and to offer better service to the public.

The principal increase in expenditure and in employment was found to have been for maintenance and renewal of roadway and of equipment. The expenditures made for the movement of traffic increased in much smaller proportion, so that the number of men per 100 miles engaged in

movement was smaller in 1900 than in 1893. The effect of renewals and repairs can be shown by comparing the number of employees per 100 miles and the ton-miles representing the work accomplished. For this purpose the former period of prosperity represented by 1893 is compared with 1900.

Between these two years the increase per cent in the total number of employees per 100 miles of line was 2.7, but the increase in ton-miles per employee was 29.9 per cent. The increase in traffic handled was thus more than ten-fold the increase in the number of employees. Enginemen decreased 4 per cent per 100 miles, but the ton-miles per engineman increased 37 per cent. About the same relative proportions were shown by firemen. Other trainmen, however, decreased per 100 miles 9 per cent, but the ton-miles per man increased 48.6 per cent. This greater efficiency of trainmen would be shown more accurately if the men engaged in movement of freight were separately enumerated. The increased work performed by the handlers of freight is no doubt in many cases several hundred per cent greater than in 1893, as the result of the increased weight and high speed of freight trains, which have also shortened the hours of labor. This speed and carrying capacity are the result of the many improvements in equipment and betterment of roadway, much of which has been charged to operating expenses.

INCREASE PER CENT OF EMPLOYEES PER 100 MILES OF LINE AND OF TON-MILEAGE, 1900 OVER 1893.

Classes.	Per 100 Miles. Per cent.	Ton-Miles. Per cent.
All employees	2.7	29.9
Enginemen	4.3[1]	37.0
Firemen	4.2[1]	38.4
Conductors	0.0	38.9
Other trainmen	9.3[1]	48.6

[1] Decrease.

In view of these changes in expenditure and in employment, first by a reduction and then by a large increase, it

may be inquired as to the effects upon the safety of railway operation. A comparison thus of the fatalities among railway employees and coal miners may be taken as representing the degree of danger to which railway employees are exposed. In general railroading is found to be more dangerous than the mining of bituminous coal in Pennsylvania, but much less so than the mining of anthracite coal. Taking the total accidents in coal mining in comparison with those on the railways the period here covered naturally falls into two groups. From 1889 to 1893 inclusive, the fatal accidents per million employees on railways were proportionally higher than those in mining coal, and the years since 1893, during which time the accidents in mining coal have increased until they are considerably higher than the accidents on railways, changing place thus with the railways as to the dangerous nature of the occupation.

The largest proportion of fatal accidents occurred in 1891, and then slightly decreased to the year 1893, when a sudden drop followed in 1894. This low proportion continued in both mining and on the railways until 1899, when a rise began. The difficulty, however, with such a comparison on the basis of numbers alone is that the condition of business is not taken into account. Thus in considering the fatal accidents on the railways the density of traffic should be taken into account, and not alone the number of men employed. The danger on a railroad, it is reasonable to expect, other things being equal, increases largely in proportion as the traffic increases.

Thus taking the accidents in relation to the traffic density, it is shown that with an increase in traffic handled there was an increase in fatalities, except for the years 1896-99. With the falling off in traffic in 1894 the number of ton-miles per mile of line showed a decided increase per fatal accident, indicating a falling off in accidents. But with the increase in traffic beginning with 1896, the rate of fatalities seems not to have increased, but really to have de-

creased. The reason for this can partly be explained by the introduction of safety appliances on the greater number of cars and of signalling apparatus. The result of better equipment was that the men engaged in movement handled more freight per man, so that fewer men in proportion to the traffic were in a position to be exposed to the danger. Thus the traffic density in 1900 was 33.5 per cent greater than in 1893, but there were 42.5 per cent more ton-miles per mile of line to each accident during this time. This shows that the danger connected with the occupation did not increase by a considerable margin in the same proportion as the traffic handled.

FATAL ACCIDENTS TO EMPLOYEES, RAILWAYS AND COAL MINES, 1889-1900.

Year.	Pennsylvania Coal Mines.[1] Per Million Employees.			Railways.	
	Bituminous.	Anthracite.	Total.	Per Million Employees.	Ton-Miles per Mile of Line per Fatal Accident.
1889	1,888	3,226	2,557	2,815	227
1890	2,183	3,463	2,823	3,272	199
1891	3,183	3,463	3,323	3,392	189
1892	1,688	3,051	2,369	3,110	213
1893	1,640	3,224	2,432	3,123	202
1894	1,441	3,144	2,292	2,341	250
1895	1,825	2,939	2,377	2,307	265
1896	2,136	2,354	2,245	2,253	281
1897	1,723	2,836	2,279	2,069	306
1898	2,255	2,886	2,570	2,240	315
1899	2,821	3,286	3,053	2,382	298
1900	2,513	2,859	2,686	2,508	288

[1] Pennsylvania Bureau of Mines, Report of 1899, pp. x, xiv; 1900, pp. xxxiii, xxxv.

With the prostration of business in 1894 and the consequent decline in railway earnings, the chief retrenchment in operating expenses was effected in the maintenance departments which furnished more than one-half the reduction and more than two-thirds of the labor discharged. The effect must have been a failure to make the necessary re-

pairs and renewals to meet ordinary deterioration. Such reductions consequently were not real retrenchments, but the saving thus made was merely temporary and was really borrowing capital invested in the property. If the earning capacity of the plant as a whole was not permanently to be impaired, such a loan had to be returned to the property at some early period.

The return of prosperity brought greatly increased earnings, a large part of which were expended for operation. Though much of these increased expenditures were necessary because of the growth of business, the larger part were evidently not necessary to handle the existing traffic. They were also not made only for the purpose of bringing the railways up to the standard of the former period of prosperity, but greatly to improve transportation facilities in order to handle traffic with the greatest economy. It was thus that a system of real retrenchment was in progress, so that the efficiency of labor engaged in movement was greatly increased over former prosperous times, while the danger of the occupation even decreased. The economies suddenly forced upon managers by the depression of 1894–97 may in this way have been made permanent.